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*Science and Technology for Tomorrow's Aerospace Forces*

## **Success Story**

### **MATERIALS ENGINEERS IMPROVE RELIABILITY OF C-17 LANDING GEAR**



Rapid deployment of a fix for C-17 landing gear problems eliminated a major operational and safety concern in the C-17 fleet and will provide the Air Force a cost avoidance of more than \$500,000 for each failure eliminated. Elimination of this failure mode also increases mission readiness.



Air Force Research Laboratory  
Wright-Patterson AFB OH

Materials and Manufacturing  
Support to the Warfighter

## Accomplishment

Engineers from the Materials and Manufacturing Directorate, working with members of the C-17 System Program Office and two Safety Investigation Boards, solved a landing gear failure problem on the C-17 aircraft. Their rapid analysis recommended use of the C-17 trunnion collar—a new design that provides fatigue-resistant thread roots.

## Background

During routine landing of a C-17 aircraft, the main landing gear failed upon impact and folded into the plane's fuselage. Responding to a request from the Safety Investigation Board, engineers from the directorate's Systems Support Division analyzed the landing gear structure to determine the reason for failure.

Analysis included a detailed examination of fracture surfaces using optical and scanning electron microscopes, and energy dispersive spectroscopy. Engineers also performed cross-sectional analysis including dimensional verification, base alloy metallurgical analysis of the chemistry, microstructure and hardness, and a residual stress survey using X-ray diffraction. In addition, they reviewed the manufacturer's processes that would affect the fatigue initiation performance of this component.

Directorate engineers determined the trunnion collar, a mechanism that keeps the 10 ft long, 800 lb gear straight with the wheel well, to be the problem. Threads cut in the trunnion collar, where a fatigue flaw initiated, use a non-standard "buttress" thread cut. Engineers use the buttress cut, designed for axial loads, when the applied loading is primarily in one direction.

Directorate engineers found this type of cut produced a high-stress concentration located at the thread root that causes fatigue crack initiation. To prevent fatigue initiation, the collar required a more uniform stress distribution, so the engineers recommended a larger root radius thread.

Procedures developed by the materials engineers helped the Air Mobility Command implement the fix on the entire fleet in just six weeks. Long term, the program office will field a further enhanced trunnion collar, incorporating both the gentler root radius threads as well as an increased cross-sectional area.

## Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTT, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (01-ML-10)